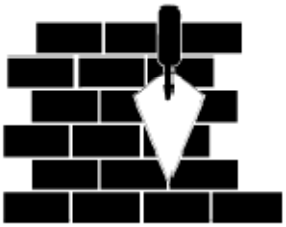
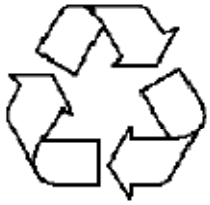
2009 Indiana Engineering & Technology Education

Recommended Course Outline Booklet

Indiana Technology Education

http://www.doe.state.in.us/OCTE/technologyed





Course Descriptions Booklet

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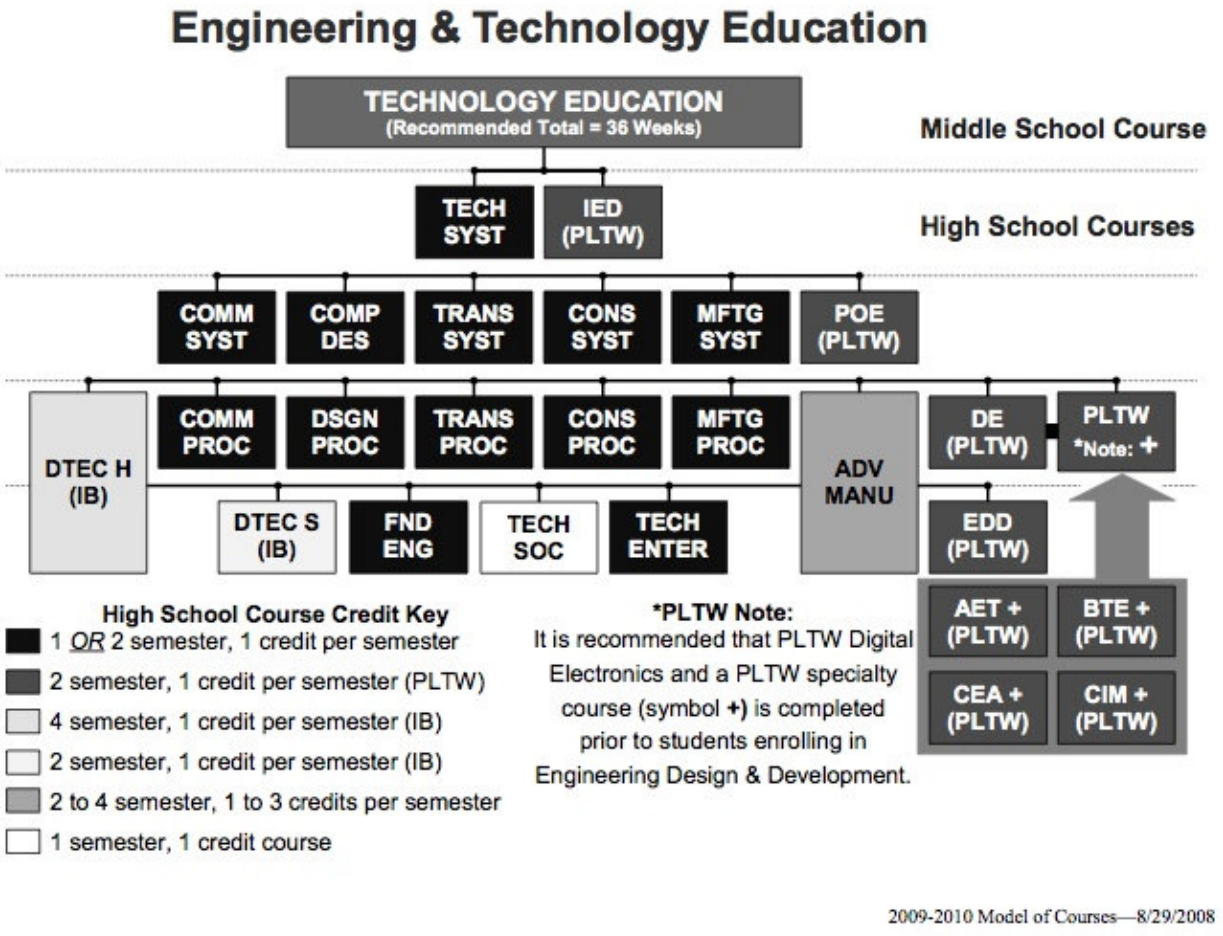
Fall 2009 Program Model Used for Indiana's E/TE Curriculum



2009-2010 Model of Courses—8/29/2008

Academic Standards for this area are available at
http://www.doe.in.gov/standards/standards2000_technology.html

Teacher Requirements for this area are available at http://doe.in.gov/dps/licensing/assignmentcode

"Technology" – Middle School or Jr. High Introductory Course (TECH ML #0490)

This course is designed to introduce students to the exciting world of technology. For this course, technology is defined as a body of knowledge and actions, used by people, to apply resources in designing, producing, and using devices, products, structures, and systems to extend the human potential for controlling and modifying the natural and human–made (modified) environment.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	What Is Technology? Technological development Designing, producing, and using technologies		30
2 (or 3*)	Impacts Of Technology Assessing technology Personal, environmental, and societal impacts		30
3 (or 2*)	Resources In Technology Types of resources Nature of resources		30
4	Developing Technology Design process Developing and testing solutions Specifying solutions		30
5	Manufacturing Technology Materials and processing techniques Types of production systems Designing and producing products		12
6	Communication / Information Technology Communication via technical means Graphic and electronic media		12
7	Transportation Technology Modes of transportation Vehicular and support systems		12
8	Construction Technology Types of structures Designing and using structures		12
9	Technology & Systems Interdisciplinary nature of technology		12

NOTE: This calendar is designed the be separated into three 12-week classes for middle school programs (6th, 7th, and 8th grades) or split into two 18-week classes for jr. high schools (7th and 8th grades). *Note how Units 2 and 3 are switched for the Junior High scenario.

Introductory Experiences In The High School E/TE Program

Technology Systems – Course Outline (TECH SYST #4808)

Technology Systems is a course that focuses on the technologies used in the career pathways related to Architecture & Construction, Arts, A/V Technology & Communications, Manufacturing, Science, Technology, Engineering & Mathematics and the Transportation, Distribution, & Logistics career clusters. Instructional strategies include creative problem solving activities that address real-world problems and opportunities. Computer experiences are used to incorporate graphics, simulations, networking, and control systems. Students are also introduced to, and engaged in, investigating career opportunities within a career cluster of their choice. Systems thinking skills are used by students to study, diagram, and test a solution to a scenario related to their career interests.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	What Is Technology Technical means Evolution of technological progress Technology and career clusters Engineering and technology	15	30
2	Technology as a System Types of technological systems Goals / objectives System inputs, processes, outputs Feedback loops	15	20
3	Designing Technological Devices and Systems Problem solving and the design process Investigation and research Generating alternative solutions Developing workable solutions Communicating technological solutions	25	40
4	Technological Systems and Career Pathways Design-related fields of endeavor Production-related fields of endeavor Service section	25	60
5	Impacts of Technology Desirable and undesirable outcomes Social issues “Green” technology	10	30

Communication Courses In The E/TE Program

Communication Systems – Course Outline (COMM SYST #4780)

Communication Systems is a course that specializes in how people use modern communication systems to exchange information and ideas. These systems allow people to grow intellectually, express feelings, and better understand diverse cultures. This course explores the application of the tools, materials, and techniques used to design, produce, use, and asses systems of communication. Instructional strategies introduce students to the world of communication technology through a variety of means including: presentations, discussions, and laboratory activities. Students will produce graphic and electronic media as they apply communication technologies. Most activities are designed for small group work since communication takes place between two parties or machines.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	Introduction to Communication Technology Technical means of ideas and information Individual versus mass communication The communication systems model Evolution of communication / information tech	15	15
2	Designing Media / Products Assessing audiences Media design techniques Visual layout Evaluating consumer / audience impacts	15	25
3	Visual (Imaging) Systems Types of photographic systems Formats of files Output techniques	10	30
4	Audio Communication Systems Designing audio media Energy use	15	20
5	Graphic Reproduction Systems Planning print media Binding and finishing tasks	15	30
6	Telecommunication Systems Selecting services and media Network design and operation	10	20
7	Internet / World Wide Web Webpage design Internet safety	10	40

Communication Processes – Course Outline (COMM PROC #4790)

Communication Processes is a course that specializes in using modern communication processes to exchange messages and information at greater volumes and improved speeds. This course explores the various technical processes used to link ideas and peoples through the uses of electronic and graphic media. Major goals of this course include an overview of communication technology; the way it has evolved, how messages are designed and produced, and how people may profit from creating information services and products. Students will explore mass media communication processes including radio and television broadcasting, publishing and printing activities, telecommunication networks, recording services, computer and data processing networks, and other related systems.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	Introduction to Communication Processes Communication processes, systems, networks Audience assessment Individual versus mass communication	10	10
2	Communication with Technical Graphics Sketching Technical drawings CADD Solids modeling	20	30
3	Developing and Producing Print Media Image design and generation Desktop publishing Assembly Finishing	15	30
4	Developing and Producing Photographic Media Planning still and video media Equipment Digital editing	15	20
5	Developing and Producing Electronic Media Classifications of electronic systems Waves, frequencies, signals, etc. Studio work Animation	20	40
6	Communication and Emerging Trends Social networking Consumerism	10	20
7	Design Problem Media development	0	30

Computer & Design Experiences In The E/TE Program

Computers In Design & Production Systems – Course Outline (COMP DES #4800)

Computers in Design and Production Systems is a course that specializes in using modern technological processes, computers, design, and production systems in the production of products and structures through the use of automated production systems. Emphasis is placed on using modern technologies and on developing career related skills. The content and activities should be developed locally in accordance with available advanced technologies in the school. Course content should address major technological content related to topics such as: design documentation using CAD systems; assignments involving the interface of CAD, CAM, and CIM technologies; computer simulation of products and systems; animation and related multimedia applications; control technologies; and automation in the modern workplace.

Design Technology Higher Level, International Baccalaureate (DTECH H IB #4822)

Design Technology Higher Level, International Baccalaureate aims to teach students not only design and technology, but also how to adapt to new experiences and how to approach problems with the appropriate skills and techniques to identify important elements and develop optimum solutions. It assumes no previous experience in either design technology or designing. Students study six core topics: designers and the design cycle, the responsibility of the designer, materials, manufacturing processes and techniques, production systems, and clean technology and green design. Students must complete additional study in three topics: raw material to final product, microstructures and macrostructures, and appropriate technologies. Optional course topics from which the student may choose two from include: food technology, computer-aided design, manufacture and production, invention, innovation and design, health by design, and electronic products.

Design Technology Standard Level, International Baccalaureate (DTECH H IB #4824)

Design Technology Standard Level, International Baccalaureate aims to teach students not only design and technology, but also how to adapt to new experiences and how to approach problems with the appropriate skills and techniques to identify important elements and develop optimum solutions. It assumes no previous experience in either design technology or designing. Students study six core topics: designers and the design cycle, the responsibility of the designer, materials, manufacturing processes and techniques, production systems, and clean technology and green design. Optional course topics from which the student may choose two from include: food technology, computer-aided design, manufacture and production, invention, innovation and design, health by design, and electronic products. Further options include raw material to final product, microstructures and macrostructures, and appropriate technologies.

Design Processes – Course Outline (DES PROC #4794)

Design Processes is a course that specializes in modern design and engineering processes with a focus on creative problem solving in developing, engineering, testing, and communicating designs for products, structures, and systems. Classroom activities help students to understand the steps used to move an idea from a designer's mind into an engineered artifact, process, or system. Students will participate in design activities using critical thinking skills that require them to: identify problems; generate alternative solutions; select and refine the most plausible solution; develop specifications for the solution; model and test the solution; and present the final solution for approval.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	Introduction to the Design Process The designed world Problem solving and engineering processes Design within modern problem solving Ideation, creativity, and innovation	20	30
2	Documenting and Presenting Designs Addressing opportunities and problems Research techniques Technical communication (sketching, drawing. modeling) The designer's portfolio	30	50
3	Identifying Potential Solutions Brainstorming Evaluating and selecting optimal solutions	5	10
4	Developmental Work Investigation and formal research Physical models and other forms of communication Oral reports and presentations	20	25
5	Testing and Evaluating Conducting tests Evaluating results Redesigning and improving scenarios	5	20
6	Presenting Solutions Sharing concepts and developed plans Preparing media	10	5
7	Research and Development Structural / mechanical / pneumatic / electronic systems Formal investigation techniques	0	40

Construction Courses In The E/TE Program

Construction Systems – Course Outline (CONS SYST #4782)

Construction Systems is a course that specializes in how people use modern construction systems and the management of resources to efficiently produce a structure on a site. Students will explore the application of tools, materials, and energy in designing, producing, using, and assessing the construction of structures. Classroom activities introduce students to the techniques used in applying construction technology to the production of residential, commercial, and industrial buildings in addition to civil structures. Students learn how architectural ideas are converted into projects and how projects are managed during a construction project in this course.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	Introduction to Construction Technology Laboratory equipment, tools, materials Types of construction Buildings and civil structures Problem solving in construction	15	20
2	Designing Structures Designing construction projects Building codes Preparing construction drawings Writing specifications	20	30
3	Building Construction Initiating the project Site work Constructing the building Installing systems Enclosing and finishing techniques	30	40
4	Constructing Civil Structures Initiating the project Site work Constructing the structure Installing systems	15	20
5	Using Constructed Structures Selecting a structure Using and maintaining structures	10	30
6	Emerging Trends in Construction Modular housing “Green” construction techniuqes	0	40

Construction Processes – Course Outline (CONS PROC #4792)

Construction Processes is a course that specializes in using modern technological processes to produce structures on a site. Structures may include residential, commercial, institutional, and industrial buildings. Additional structures may include special purpose facilities built for displays, sports contests, and transportation terminals. Students will study construction technology topics such as preparing a site, doing earthwork, setting footings and foundations, building the superstructure, enclosing the structure, installing systems, finishing the structure, and completing the site. Students may also investigate topics related to the purchasing and maintenance of structures.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	Introduction to Construction Processes Technical means within the constructed world Types of construction projects Construction personnel	5	5
2	Construction Contracting Architectural / residential drawings Scheduling Contract documentation	20	30
3	Purchasing and Financial Structures Determining needs / wants Selection criteria Financial options	5	5
4	Managing and Organizing Construction Planning and organizing jobs Monitoring and control techniques	5	5
5	Construction Resources Construction tools Construction materials	10	15
6	Construction Techniques Preparing sites and setting foundations Erecting superstructures Installing utilities and systems' Finishing interiors and exteriors Competing site work	25	30
7	Maintaining and Re-Using Structures Maintaining structures and systems Repairing structures and systems	20	30
8	Community Planning Designing and analyzing communities Developing and presenting community plans	0	60

Manufacturing Courses In The E/TE Program

Manufacturing Systems – Course Outline (MFTG SYST #4784)

Manufacturing Systems is a course that specializes in how people use modern manufacturing systems with an introduction to manufacturing technology and its relationship to society, individuals, and the environment. An understanding of manufacturing provides a background toward developing engineering & technological literacy. This understanding is developed through the study of the two major technologies, material processing and management technology, used by all manufacturing enterprises. Activities allow students to study techniques used in identifying and obtaining resources in addition to developing an understanding of the primary and secondary processes used to convert raw materials into finished products.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	Introduction to Manufacturing Technology Manufacturing sector and its impact on society Sample production run	10	10
2	Production Materials Types of materials Properties of materials	10	15
3	Manufacturing Processes Obtaining resources Casting and molding techniques Forming processes Separating processes Conditioning processes Assembly processes Finishing processes Automation of production processes	30	40
4	Developing and Producing Products Design procedures Communicating designs	10	25
5	Manufacturing Engineering Developing the production plan Developing the production facility	15	25
6	Quality Systems Developing quality enhancement programs Designing inspection materials Statistical Q.C. techniques	10	35
7	Manufacturing and Emerging Trends Skill sets Modern production and global markets “Green” techniques	5	30

Manufacturing Processes – Course Outline (MFTG PROC #4796)

Manufacturing Processes is a course that specializes in using modern manufacturing processes to obtain resources and change them into industrial materials, industrial products and consumer products. Activities provide an understanding of the characteristics and properties of industrial materials and the processing of these materials into consumer goods. Students will investigate the properties of engineered materials such as: metals; polymers; ceramics; and composites. After gaining a working knowledge of these materials, students will study six major types of material processes: casting and molding; forming; separating; conditioning; finishing; and assembling. In this course, each of these processes is a major body of content. It is through the study of common principles, supported by related laboratory and problem solving activities, that understanding is developed and reinforced.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	Manufacturing Processes Manufacturing materials and processes Industrial classification of processes Emerging trends	10	15
2	Manufacturing Materials Material properties and characteristics Advanced materials Destructive and non-destructive testing	15	20
3	Fabrication Operations Casting processes Forming processes Separating processes Conditioning processes	25	35
4	Assembling and Finishing Tasks Assembly processes Finishing processes Packaging processes	15	20
5	Maintaining Quality Standards Quality assurance versus quality control Inspection materials and techniques ISO standards	15	20
6	Automating Processes Principles of automation and robotics Using and assessing automated systems	10	40
7	Modern Manufacturing Systems Repair and maintaining products “Green” production techniques	0	30

Transportation Courses In The E/TE Program

Transportation Systems – Course Outline (TRAN SYST #4786)

Transportation Systems is a course that specializes in the study of the transportation systems used to support commerce and the logistics for the efficient movement of goods and people. In this course, students will explore the systems, techniques and vehicles used to move people and cargo on land, water, air, and space. Activities allow students to understand a variety of transportation systems and investigate the energy, power and mechanical systems used to move people and products from one location to another.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	Introduction to Transportation Technology Technical means within the transportation sector Individual versus mass transportation Transportation systems model Evolution of vehicles and systems	10	15
2	Transportation Environments Land-based systems Water / marine-based systems Aviation Space-based systems Intermodal systems	20	30
3	Vehicular Sub-Systems Structure Suspension Propulsion Guidance Control Support	35	45
4	Developing Transportation Systems Vehicles and transportation systems Guideways Routes and schedules Energy usage	10	30
5	Operating Transportation Systems Routing Loading / un-loading Moving Storage	10	30
6	Using and Assessing Transportation Systems Selecting and using transportation services Evaluating and assessing systems	5	30

Transportation Processes – Course Outline (TRAN PROC #4798)

Transportation Processes is a course that specializes in the study of the transportation processes and the logistics of moving people, cargo and goods from one location to another. Transportation is a managed system that uses inputs, processes, and outputs to move people, cargo and goods. Content of this course includes the study of how transportation impacts individuals, society, and the environment and how these processes require continual assessment/feedback to control the system. This course focuses on the environments in which transportation occurs: land, air, water, and space and the logistical processes for receiving, storing, routing, loading, transporting, unloading, storing and delivering of people, cargo and goods.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	Introduction to Transportation Processes Transportation systems Environments of motion Transportation systems model Governance and regulation	10	10
2	Distribution and Logistics Establishing routes Scheduling techniques Physical distribution Tracking shipments	15	30
3	Transporting Cargo / Freight Types of cargo and systems Transportation equipment Special requirements Loading and un-loading operations	25	25
4	Transporting Passengers Moving individuals / humans Transportation equipment Special requirements Loading and un-loading operations	25	25
5	Transportation and Emerging Trends Environmental issues Security issues	15	30
6	Applying Transportation Processes Design and problem solving in transportation	0	60

Application Level Courses In The E/TE Program

Fundamentals Of Engineering – Course Outline (FUND ENG #4802)

Fundamentals of Engineering is a course that focuses on the process of applying engineering, technological, scientific and mathematical principles in the design, production, and operation of products, structures, and systems. An engineer is a highly educated and trained problem solver who engages in the functions of research, development, planning, design, production, and project management. Engineers often work as part of a team to plan, design, and supervise a product from concept to completion. This is a hands-on course designed to provide students interested in engineering careers to explore experiences related to specialized fields such as civil, mechanical, and materials engineering, etc. The topics of ethics and the impacts of engineering decisions are also addressed. Classroom activities are organized to allow students to work in teams and use modern technological processes, computers, CAD software, and production systems in developing and presenting solutions to engineering problems.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	Introduction to Engineering Engineering and society Engineering and the future	5	5
2	Problem Solving and Design Design process Problems and opportunities Ergonomics	10	15
3	Tools of Engineering Computer applications	15	40
4	Material Science Structure and properties of materials Material testing	10	30
5	Mechanics, Controls, and Automation Mechanical and fluid systems Electrical and electronic systems	15	15
6	Structures Types and uses of structures	5	15
7	Energy Systems Forms of energy	20	20
6	Trends in Engineering Emerging issues and solutions	10	5
7	Applications of Engineering Concepts Design competitions (IMSTEA, FIRST, TSA, etc.)	0	35

Technology & Society – Course Outline (TECH SOC #4804)

Technology and Society is a course that specializes in the study of technology as a pervasive, complex force that is interwoven in the cultural, social, political, ethical and intellectual existence of all people. The development of technology has brought about new dangers related to material and social wealth. This is leading to a growing awareness of the direct and indirect consequences of our technological world, and the need to develop alternative means of accomplishing societal goals. As technologies become more powerful and integrated across societies, the ability to foresee the social, economic, and environmental consequences of their development has become increasingly critical. The goal of this course is to increase student awareness of the uncertainties and future direction associated with technological development. Emphasis is given to the nature of technology, the impact of devices and systems on the quality of life, assessment of the benefits and risks of technology, and technological ethics for responsible decision-making.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week
1	Technological Development Evolution of technology Triggers of technological Invention and innovation Alternative views of progress	15
2	The Nature of Science and Technology Differentiations between science and technology Use of knowledge to address opportunities and problems Technology and standards-of-living Dependency on technology	10
3	Technology and Change Modern and emerging technology Social and cultural consequences Evaluating technological trends Environmental consequences	10
4	Technology and Ethics Social and technological efficiency Civic responsibility Informed decision-making	10
5	Social. Cultural, and Environmental Consequences Problems related to technological development Evaluation of existing and planned projects Assessing technological conditions	20
6	Managing Our Technological Future Technology assessment Technological forecasting	25

Technology Enterprise – Course Outline (TECH ENTER #4806)

Technology Enterprises is an application course that allows students to apply technological, engineering, and managerial principles in organizing, financing, and operating a company to produce a product, structure, or service. Students learn through this course how enterprises are developed and operated in an efficient manner. The key focus of this course is to allow students to structure and operate a real-life enterprise within the classroom environment. Students learn about the kinds of productive enterprises; principles of management; how to develop products and services; how to organize and operate an enterprise; the delivery of products or services; the marketing of products or services and the closing of an enterprise.

UNIT	UNIT TITLE AND CONTENT	# OF DAYS 18-Week	36-Week
1	Introduction to Productive Enterprises Types of enterprises Management techniques Producing goods versus services Competitive nature of a global marketplace	15	20
2	Management Ownership Levels of authority Responsibilities of management Team-building Labor organizations	5	25
3	Developing Products and Services Identifying wants and needs Generating and enhancing ideas Proposing and improving potential solutions	20	25
4	Organizing an Enterprise Developing the structure Incorporating the unit Acquiring needed resources Staffing and scheduling	5	20
5	Operating the Enterprise Day-to-day operations Production Quality assessment Financial record-keeping	30	40
6	Delivering / Marketing the Product or Service Promotion and marketing of the product or service Distribution	10	30
7	Closing an Enterprise Dissolving the organization Annual reporting	5	20